

sustained in the city, as to loss in wrecked buildings, water-soaked household effects, merchandise, etc., was about \$50,000, and the loss to crops about \$10,000; (5) that no one was killed, but that six persons were injured.

Dr. E. F. Hodges, of Booneville, in a press dispatch, has stated that:

Later reports showed that 48 houses were either partially or totally destroyed; that the lowest estimate of the damage sustained was about \$50,000; and that the heavy rains in Logan County did great damage to crops in the lowlands.

Another press report from Booneville says: (1) That the wind blew at an estimated velocity of 75 miles an hour, and that the storm was accompanied by a heavy downpour of rain; (2) trees were uprooted, fences were lifted high and strewn about the streets; houses, some remaining intact and some completely wrecked, were lifted from their foundations and carried some distance; many buildings were unroofed, as were several freight cars standing in the railroad yards; (3) the high school building had all the interior wrecked by the storm, while the walls remained intact.

This storm developed in the northwest quadrant of a small and shallow barometric depression that was central over the central part of Arkansas on the morning of August 3, with unusually steep barometric gradient to the northward. The pressure was 29.98 inches, and the wind northeast at Fort Smith (about 33 miles northwest of Booneville), and 29.95 inches, and wind northwest at Little Rock.

The tornado appears to have spent all its force within the limits of Booneville and its suburbs.

#### CAUSE OF THE EQUABLE TEMPERATURE CONDITIONS AT NEW ORLEANS, LA.

By EDWARD D. COBERLY, Local Forecaster.

It is a well-known fact that proximity to large bodies of water renders the climate of any locality less severe and gives greater freedom from sudden changes than is enjoyed by places removed from an extended water surface. When the locality is nearly or quite surrounded by water, this effect is accentuated, and stands out clearly when the records of temperatures are examined from places differently located with reference to the water surface.

It is the purpose of this article to show in a brief manner why the winter climate of New Orleans is less severe and the summer weather cooler and more pleasant than at places located farther inland or at places located on the open Gulf, but with no large body of water to the northward to protect them against the extreme heat of summer and cold of winter carried by the northerly winds from the interior of the country.

New Orleans is practically surrounded by a water surface, and in addition the level of ground water in the city itself is very high, keeping the surface much more nearly in a saturated condition than in the other localities considered in this investigation. To the north of the city is Lake Pontchartrain, a body of water of large extent, but relatively shallow (its greatest depth being but 15 to 20 feet), to the northwest is Lake Maurepas, to the southwest Lake Salvador, and to the east Lake Borgne, while to the southward, 40 to 60 miles distant in a straight line, is the broad expanse of the Gulf of Mexico, and directly in front of the city, almost inclosing it in a curve, runs the Mississippi River, approximately three-fourths of a mile wide and more than 100 feet deep. In addition to the aforementioned bodies of water, there are in this vicinity large areas of marsh land, covered with water

during the larger part of the year, and numerous creeks and bayous course the region, so that the reader can readily see that the proportion of water to land surface is very large.

Physical experiments tell us that it takes about four times as many calories of heat to raise the temperature of a water surface by a given amount as it does to raise the temperature of a land surface by the same amount. The exact proportion varies with the character of the land surface, a sandy surface heating up more quickly in the sunlight and cooling more quickly in the shade than a similar surface composed of a clay soil. Likewise in cooling during the night and in winter the water surface cools much more slowly than the land and liberates a much larger quantity of heat than a land surface would liberate in cooling the same number of degrees. In other words, if the temperature of a water surface is lowered  $1^{\circ}$ , enough heat is liberated to raise the temperature of the overlying air about  $4^{\circ}$ , while a land surface in cooling  $1^{\circ}$  would liberate only enough heat to raise the temperature of the overlying air one-fourth degree. This shows very clearly that the large water surface adjacent to the city of New Orleans must exert a great influence on the temperatures there observed. Indeed, if it were not for this influence, there is no doubt in the writer's mind the summers would be much hotter and the winters much colder than they now are.

In order to bring out the facts in the case, the climatic records for New Orleans, La., Amite, La., located north of Lake Pontchartrain some distance, and in a county characterized by loose, sandy soil, and Mobile, Ala., with Mobile Bay on the Gulf side, but with no water surface to the northward, have been summarized, and the results are presented herewith. The locations of the places discussed are such that with similar exposure relative to the water surface there should be no such differences in temperatures as are seen to exist.

Let us first consider the normal temperatures of the places month by month. January is the coldest month of the year, the monthly mean at New Orleans being  $53.0^{\circ}$ , while at Mobile it is  $49.8^{\circ}$ , or  $3.2^{\circ}$  degrees colder than at New Orleans, and at Amite it is  $51.3^{\circ}$ , or  $1.7^{\circ}$  colder than New Orleans. During the midsummer months the means differ but little, the prevailing winds at all places then coming from the southward, and consequently off a water surface, the July mean at both New Orleans and Amite being  $81.3^{\circ}$  and at Mobile  $80.5^{\circ}$ , while during August Amite is the warmest of the three places, as was expected from the location of the place, the greater frequency of winds from a northerly quarter, and the fact that there are fewer rainy days at that station during August than July, thereby allowing the sandy soil to heat rapidly by day, thus storing more heat than is lost at night by radiation.

We will now take up the mean maximum temperatures. During the winter months the differences in mean maxima are not marked, but it is noted that the mean maximum at Amite is higher than at either Mobile or New Orleans, which is as expected from its location, the sandy soil heating rapidly by day and warming the overlying air by conduction and local convection. In summer the differences are more marked and more important from the standpoint of comfort of the inhabitants of the cities. July is the warmest month, considering the maximum temperatures, in New Orleans, the mean maximum being  $89^{\circ}$ ; June and August have mean maxima of  $87^{\circ}$  and  $88^{\circ}$ , respectively. At Mobile the mean maximum for June is  $88^{\circ}$ , July  $90^{\circ}$ , and August  $89^{\circ}$ , while the same months at Amite show  $91^{\circ}$ ,  $92^{\circ}$ , and  $92^{\circ}$ , respectively. This shows clearly how

the maximum temperatures are kept down to moderate measures by the great absorptive power of the large water surface adjacent to New Orleans.

In the case of the mean minimum temperatures the facts come more clearly to view than in any of the preceding cases. In January the mean of the lowest temperatures at New Orleans is 47°, at Mobile 43°, and at Amite 40°, thus showing at a glance how the minima at New Orleans are kept up by the warmth of the adjacent water, and how low temperatures are accentuated by a radiating surface of loose sandy soil such as that at Amite, La. During the summer months the minima are higher at New Orleans than at either Amite or Mobile, thus giving a smaller diurnal range of temperature at New Orleans than is enjoyed by places less favorably situated.

In considering extremes of temperature the tables following this discussion speak for themselves. The absolute minima are higher and the absolute maxima lower at New Orleans than at either of the other two places for which data are given. A maximum temperature of 100° has been recorded twice at New Orleans and a maximum of 102° once within 41 years, and these readings were recorded in July and August only, the temperature having never reached the 100° mark in any other months of the year. At Mobile the record is: June, 101°; July, 102°; August, 101°; while at Amite the records for those months are 105°, 104°, and 104°, respectively. At New Orleans, while the temperature reaches 90° every year, during 15 out of the last 41 years the highest temperature for the year has been below 95°.

The lowest temperature ever recorded at New Orleans was 7°, while at Amite it was 1°, and at Mobile -1°. It is this absence of extremely low minima, except on very rare occasions, that makes possible the raising of many varieties of the orange in and near New Orleans that can not be cultivated elsewhere on the Gulf coast outside of the State of Florida. In 3 years out of the last 41 freezing temperatures have not been recorded in New Orleans, and in 22 years out of 41 the annual minimum temperature has been higher than 25°.

The writer believes that he has shown conclusively that the large water surface surrounding the city of New

Orleans exerts a marked and powerful control over temperature conditions in and near the city, rendering the winters warmer and the summers cooler than would otherwise be the case, and giving a freedom from extreme heat, cold, and sudden changes not enjoyed elsewhere in the Mississippi Valley.

As an appendix I have presented in tabular form a brief summary of temperature conditions at the stations discussed, compiled from all available figures, which it is believed will prove valuable and instructive in connection with the point under consideration.

#### Appendix.

##### NORMAL TEMPERATURE (TENTHS).

| Stations.       | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|-----------------|------|------|------|------|------|-------|-------|------|-------|------|------|------|
| New Orleans.... | 53.0 | 56.3 | 62.0 | 67.9 | 74.5 | 79.6  | 81.3  | 81.0 | 78.0  | 69.5 | 60.6 | 54.4 |
| Mobile.....     | 49.8 | 53.2 | 59.1 | 66.0 | 73.6 | 79.1  | 80.5  | 79.7 | 76.5  | 67.1 | 57.5 | 51.5 |
| Amite.....      | 51.3 | 52.6 | 62.1 | 67.3 | 73.8 | 79.7  | 81.3  | 81.3 | 77.3  | 66.5 | 58.7 | 51.1 |

##### MEAN MAXIMUM TEMPERATURES.

| Stations.       | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|-----------------|------|------|------|------|------|-------|-------|------|-------|------|------|------|
| New Orleans.... | 61   | 64   | 70   | 76   | 83   | 87    | 89    | 88   | 85    | 78   | 69   | 63   |
| Mobile.....     | 59   | 62   | 68   | 75   | 83   | 88    | 89    | 89   | 86    | 77   | 67   | 60   |
| Amite.....      | 62   | 64   | 73   | 79   | 86   | 91    | 92    | 92   | 89    | 81   | 71   | 65   |

##### MEAN MINIMUM TEMPERATURES.

| Stations.       | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|-----------------|------|------|------|------|------|-------|-------|------|-------|------|------|------|
| New Orleans.... | 47   | 50   | 55   | 61   | 68   | 74    | 76    | 75   | 72    | 63   | 54   | 48   |
| Mobile.....     | 43   | 46   | 52   | 58   | 66   | 72    | 74    | 73   | 70    | 59   | 50   | 46   |
| Amite.....      | 40   | 42   | 50   | 56   | 63   | 68    | 70    | 70   | 65    | 52   | 46   | 40   |

##### ABSOLUTE MAXIMUM TEMPERATURES.

| Stations.       | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|-----------------|------|------|------|------|------|-------|-------|------|-------|------|------|------|
| New Orleans.... | 82   | 82   | 86   | 89   | 94   | 98    | 102   | 100  | 96    | 94   | 85   | 83   |
| Mobile.....     | 78   | 80   | 86   | 90   | 98   | 101   | 102   | 101  | 97    | 95   | 83   | 80   |
| Amite.....      | 83   | 84   | 90   | 91   | 98   | 105   | 104   | 104  | 99    | 98   | 89   | 85   |

##### ABSOLUTE MINIMUM TEMPERATURES.

| Stations.       | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|-----------------|------|------|------|------|------|-------|-------|------|-------|------|------|------|
| New Orleans.... | 15   | 7    | 30   | 38   | 52   | 58    | 68    | 63   | 55    | 40   | 29   | 20   |
| Mobile.....     | 11   | -1   | 25   | 32   | 46   | 50    | 64    | 57   | 49    | 34   | 25   | 14   |
| Amite.....      | 13   | 1    | 20   | 28   | 38   | 50    | 53    | 50   | 44    | 29   | 22   | 10   |